



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/923,911	08/07/2001	Benjamin L. Lee	TI-31446	5526
23494	7590	09/08/2004	EXAMINER	
TEXAS INSTRUMENTS INCORPORATED P O BOX 655474, M/S 3999 DALLAS, TX 75265			AMARI, ALESSANDRO V	
			ART UNIT	PAPER NUMBER
			2872	

DATE MAILED: 09/08/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/923,911

Applicant(s)

LEE ET AL.

Examiner

Alessandro V. Amari

Art Unit

2872

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-36 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 14-26 is/are allowed.
- 6) ☒ Claim(s) 1,3-13 and 27 is/are rejected.
- 7) ☒ Claim(s) 2 and 28-36 is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 2/11/2002.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: ____.

DETAILED ACTION

Claim Objections

1. Claims 1-6 and 14-36 are objected to because of the following informalities:

In regard to claims 1 and 14, line 1, the term "MEMS" should be spelled out.

Claims 2-6 and 15-20 inherit the same issue.

Regarding claim 16, line 3, the phrase "said DMDs" lacks antecedent basis and the term "DMD" should be spelled out.

Regarding claim 21, line 10, the phrase, "said MEMS device" lacks antecedent basis. Claims 22-26 inherit the same issue.

Regarding claim 24, line 3, the phrase, "the DMD" lacks antecedent basis and should be spelled out. Claims 25 and 26 inherit the same issue.

In regard to claim 27, the term "DMD" should be spelled out. Claims 28-36 inherit the same issue.

Regarding claim 28, the phrase, "said MEMS device" lacks antecedent basis. Claims 29-36 inherit the same issue.

Appropriate correction is required.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 1 and 3-8 are rejected under 35 U.S.C. 102(b) as being anticipated by Bloom et al US Patent 5,311,360.

In regard to claim 1, Bloom et al teaches (see Figures 7, 8) a method for efficient operation of a two-dimensional MEMS grating, said method comprising selecting a wavelength of near monochromatic spatially coherent light, determining a grating pitch, an angle of incidence, a tilt angle and a diffraction order to satisfy:

$$\theta_t(\theta_i, n) = \frac{1}{2} \{ \arcsin [n\lambda/d] \text{SQRT } 2 - \sin(\theta_i) \} + \theta_i$$

as described in column 3, lines 10-53 and column 7, lines 13-43. Although the prior art does not specifically teach the claimed equation, this feature is seen to be an inherent teaching of this device since the device is a grating which is characterized by the grating equation. The claimed equation is a derivation of the grating equation.

Regarding claim 3, Bloom et al teaches determining a grating pitch, an angle of incident, a tilt angle, and a diffraction order comprising determining a grating pitch and a tilt angle for a micromirror device as shown in Figures 7 and 8 and as described in column 7, lines 13-43.

Regarding claim 4, Bloom et al teaches illuminating said MEMS grating with near monotonic spatially coherent light at said angle of incidence; and collecting said near monotonic spatially coherent light from said nth diffraction order as described in column 3, lines 10-53 and column 7, lines 13-43.

Regarding claim 5, Bloom et al teaches that said illuminating performed such that said illumination light and said collected light traverse a common path as shown in

Figures 3, 4, 7 and 8 and as described in column 3, lines 10-53 and column 7, lines 13-43.

Regarding claim 6, Bloom et al teaches determining a grating pitch, an angle of incident, a tilt angle, and a diffraction order comprising determining a grating pitch and a tilt angle for a micromirror device as shown in Figures, 3, 4, 7 and 8 and as described in column 7, lines 13-43.

In regard to claim 7, Bloom et al teaches (see Figures 7, 8) a micromirror device comprising a two-dimensional array of deflectable mirrors (48), said array having a pitch distance between adjacent mirrors as shown in Figures 7 and 8, a deflectable member (50) supporting each said mirror, said deflectable member establishing a tilt angle for each its corresponding mirror; and wherein said micromirror device is blazed for near monochromatic spatially coherent light having a wavelength in the range of 1480-1580 nm as described in column 7, lines 13-43. Although the prior art does not specifically teach the light in the range recited, this is seen to be an inherent teaching of this device since this device is used in the optical communication field and the ranges cited operate in that field.

Regarding claim 8, Bloom et al teaches that said micromirror device is blazed in the Littrow condition for near monochromatic spatially coherent light having a wavelength in the range of 1480-1580 nm as described in column 7, lines 13-43. Although the prior art does not specifically teach that the device is blazed in the Littrow condition, this is seen to be an inherent teaching of this device since there is some condition, wherein the micromirror device meets the Littrow condition.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 9-13 and 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kessler et al US Patent 6,434,291 in view of Bloom et al US Patent 5,311,360.

In regard to claims 9 and 27, Kessler et al teaches (see Figures 1-6) a system for fiber optic/telecommunication switching/modulating applications, comprising an optical grating (130), one or more near monochromatic spatially coherent light input signals coupled to said optical grating, said optical grating converting said light into collimated channels of varying frequency, said collimated light being passed through condensing optics (140) onto the surface of a micromirror device (150) as described in column 5, lines 29-34.

Regarding claims 9, 10-13, Kessler teaches that the system can add or remove, selectively switch or modulate or attenuate frequency channels from said light as described in column 2, lines 1-14.

However, in regard to claim 9, Kessler does not teach a two-dimensional array of deflectable mirrors, said array having a pitch distance between adjacent mirrors, a deflectable member supporting each said mirror, said deflectable member establishing a tilt angle for each its corresponding mirror; and wherein said micromirror device is blazed for near monochromatic spatially coherent light having a wavelength in the range

of 1480-1580 nm or wherein the DMD is fabricated with pixel pitch and tilt angle optimized to meet blazed operational conditions.

In regard to claim 9, Bloom et al does teach a two-dimensional array of deflectable mirrors (48), said array having a pitch distance between adjacent mirrors as shown in Figures 7 and 8, a deflectable member (50) supporting each said mirror, said deflectable member establishing a tilt angle for each its corresponding mirror; and wherein said micromirror device is blazed for near monochromatic spatially coherent light having a wavelength in the range of 1480-1580 nm and wherein the DMD is fabricated with pixel pitch and tilt angle optimized to meet blazed operational conditions as described in column 7, lines 13-43. Although the prior art does not specifically teach the light in the range recited, this is seen to be an inherent teaching of this device since this device is used in the optical communication field and the ranges cited operate in that field.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to utilize the mirrors of Bloom et al in the device of Kessler et al in order to provide for high resolution, high modulation depth, optical flatness, VLSI compatible, easy handling compatibility and low cost as described in column 3, lines 10-17 of Bloom et al.

Allowable Subject Matter

6. Claims 14-26 are allowed.

7. Claims 2 and 28-36 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

8. Claim 2 is allowable over the prior art for at least the reason that the prior art fails to teach or reasonably suggest, "a center of a Fraunhofer envelope is aligned with said nth diffraction order" as set forth in the claimed combination.

Claim 14 is allowable over the prior art for at least the reason that the prior art fails to teach or reasonably suggest, " $\sin(\theta_n) = \sin(\theta_f)$ where θ_f is the angle for the Fraunhofer envelope, to align the center of the Fraunhofer envelope center with diffraction order n" as set forth in the claimed combination. Claims 15-20 are also allowable based upon their dependence on claim 14.

Claim 21 is allowable over the prior art for at least the reason that the prior art fails to teach or reasonably suggest, " θ_f is the angle for the Fraunhofer envelope to aligned with one of the n diffraction orders" as set forth in the claimed combination. Claims 23-26 are also allowable based upon their dependence on claim 21.

Claim 28 is allowable over the prior art for at least the reason that the prior art fails to teach or reasonably suggest, " $\sin(\theta_n) = \sin(\theta_f)$ where θ_f is the angle for the Fraunhofer envelope, to align the center of the Fraunhofer envelope center with diffraction order n" as set forth in the claimed combination. Claims 29-36 are also allowable based upon their dependence on claim 28.

The prior art, Bloom et al and Kessler et al teach a system for optical telecommunications comprising an optical grating, wherein the device satisfies the

claimed equation. However, the prior art does not teach that a center of a Fraunhofer envelope is aligned with said nth diffraction order and there is no motivation or teaching to modify this difference as derived.

Conclusion

9. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Pilosof US Patent 6,618,187 teaches a blazed micromechanical light modulator as shown in Figures 3-5.

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Alessandro V. Amari whose telephone number is (571) 272-2306. The examiner can normally be reached on Monday-Friday 8:00 AM to 5:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Drew Dunn can be reached on (571) 272-2312. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).


Application/Control Number: 09/923,911

Page 9

Art Unit: 2872

ava *MM*

30 August 2004


MARK A. ROBINSON
PRIMARY EXAMINER